

AVIAN PREDATION OF THE EVERGREEN BAGWORM (LEPIDOPTERA: PSYCHIDAE)

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Abstract.—We report for the first time predation of evergreen bagworms, *Thyridopteryx ephemeraeformis* (Haworth) (Lepidoptera: Psychidae), by English Sparrows, *Passer domesticus* (L.). Sparrows were removing bagworm bags from a juniper planting and carried them to sheltered locations. They fed on the larvae by squeezing their bags repeatedly from one end to the other (to squeeze out guts and hemolymph) or by vigorously shaking the bag to eject the larvae. Of 359 bagworm bags that had accumulated on sidewalks and under nearby trees, birds had apparently completely extracted larvae from 62% of the bags and killed another 36% of larvae.

Key Words: population regulation, bird behavior, predation, ornamental plants

Evergreen bagworm, *Thyridopteryx ephemeraeformis* (Haworth) (Lepidoptera: Psychidae), is an important pest of woody ornamental plants throughout the eastern United States, feeding on more than 126 plant species (Davis 1964, Johnson and Lyon 1988). The primary host plants of bagworms are arborvitae (*Thuja* spp.) and juniper (*Juniperus* spp.) (Johnson and Lyon 1988), which are abundant ornamental plants (Dirr 1990). Bagworm larvae consume the leaves and green stems of host plants, and heavy infestations destroy the esthetic value of ornamental plants, and in extreme cases, kill them. Each bagworm larva constructs a bag of silk, decorated with fragments of leaves and small branches, that may reach a length of up to 5 cm in later instars (Johnson and Lyon 1988).

Parasitoids and pathogenic fungi of evergreen bagworm larvae may cause insufficient mortality to control populations (Baldus 1937, Kulman 1965, Barrows 1974, Barrows and Gordh 1974, Berisford and Tsao 1975a, b, Sheppard and Stairs 1976,

Horn and Sheppard 1979, Gross and Fritz 1982, Cronin 1989). The impact of vertebrate predators on bagworm populations rarely has been investigated; these include rodents (Cronin 1989) and birds (English sparrows, blackbirds, tufted titmice, chickadees, and Carolina wrens; Haseman 1912, Horn and Sheppard 1979, Summers-Smith 1988, Lowther and Cink 1992). In this paper, we describe for the first time predation of evergreen bagworm by English sparrows, *Passer domesticus* (L.).

MATERIALS AND METHODS

In August 1998, we observed English sparrows picking bagworm larvae from a heavily infested juniper planting on the campus of the University of Illinois, Urbana-Champaign (UIUC) and carrying them away. The planting measured 550 m² and was bordered on one side by a busy street and on the other sides by concrete steps and a stone observation deck. To study foraging rates and behavior, we observed sparrows for 6 days between 15 and

23 August 1998 for 1–2 hour periods from 6:30 am to 4:30 pm. During observation periods, ambient temperature ranged from 14° to 32° C.

To determine how sparrows were feeding on bagworms, we placed 10 to 15 live bagworms (in their bags) on the observation deck near the juniper planting and recorded bird behavior with a Panasonic AG-456UP video camera positioned 5–10 m away. We videotaped birds on 18 and 19 August from 11:00 am to 3:00 pm; both days were sunny and temperatures ranged from 16° to 30° C.

We collected a total of 359 bagworm bags from the sidewalk and beneath nearby trees and shrubs (white pine, yew, and birch) on 13 and 19 August; because bagworms rarely feed on these tree species (Johnson and Lyon 1988, personal observation), we concluded that birds had carried the bags there to feed. We cut these bags open with scissors and examined their contents. Many bags were partially buried, suggesting that birds had been feeding on bagworms under these trees for a long time.

RESULTS

At least three male and three female sparrows were preying on bagworms during our study. They apparently located their prey visually, possibly using the movement of crawling larvae, either watching from railings, the observation deck, or within the juniper planting. Birds removed bagworms on the wing or by landing on a nearby branch. Rates of predation averaged 5 ± 7.8 (mean $\pm$ SD, $N = 9$) bagworms taken per hour. Birds carried bagworms in their beaks to nearby areas, including sidewalks, under parked cars, and the base of the nearby trees and shrubs where they consumed the larvae.

Our videotape of bird behavior revealed the following: 1) birds often picked up bags with their beaks ($N = 43$) apparently to assess the weight of bags to determine whether they contained larvae; 2) birds bit bags repeatedly from one end to the other ($N = 4$) squeezing hemolymph and guts out a bag

opening like squeezing toothpaste out a tube, which they then consumed; 3) birds flew away with a bag in their beaks to a sheltered site where they ate bagworms ($N = 7$); 4) birds shook the bag violently in their beaks ($N = 9$), apparently to dislodge the larvae so they could be consumed.

Consistent with the behaviors we observed, of 359 bags we collected, 62% were completely empty but otherwise intact, 36% contained dead larvae or remnants of larvae, and 2% had living larvae in them. We conclude that larvae had been removed from empty bags by birds because bagworm larvae never voluntarily abandon their bags. In addition, bags with dead or missing larvae were stained green and brown (apparently with hemolymph), similar to the condition of bags squeezed by sparrows, suggesting the larvae had been eaten.

DISCUSSION

We observed bagworm predation by sparrows at only one site; we found no evidence of this behavior anywhere else on the UIUC campus, or in nearby urban areas, even where bagworms were abundant and English sparrows present. Apparently only one sparrow group had learned to collect and feed on bagworm larvae, presumably by social learning (Fryday and Greig-Smith 1994). English sparrows are opportunistic feeders, with diet composition reflecting food availability and varying with locality and season (Summers-Smith 1988, Lowther and Cink 1992). Annual percent animal content of their diet is typically low, but is often high during the summer months; animal content is important for egg development and represents a large proportion of the diet of hatchlings (Summers-Smith 1988, Lowther and Cink 1992). The fairly high predation rates we observed suggest that English sparrows could be important natural enemies in suppressing infestations of the evergreen bagworm in ornamental plantings.

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